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#### IV. An Account of Chylification, by Mr. William Cowper.

**T**HE occasion of the following Paper, was in Compliance to some ingenious Enquirers about the Process of Nature in Chylification ; so that a Philosophical Account of that grand Operation, is not here so much aimed at, as a brief Anatomical Enumeration of Matter of fact, in the several Steps made use of for that purpose : Nor had any part of Controversie had any place in it, but in answer to an ingenious Person, who supposed the Menstruum of the Stomach, after having there Impregnated the Aliment by its austere faculty, should oblige that part to Contract, in order to void its Contents, as appears by the sixth Paragraph.

#### Of CHYLIFICATION.

**T**HØ Chylification is said to begin in the Stomach, yet in regard the grosser parts of that Aliment ought to undergo a notable Preparation before they are fitted for its Reception ; it therefore seems pertinent to an Account of this grand Operation in Nature, to consider the Materials of Nuriment in all their Stages, especially in their first Reception into the Mouth, what necessary Alterations and Mixtures they there meet with, before they descend into the Stomach.

The Aliment which we shall here first speak of, is such, as whose grossness of parts require Mastication or Chewing ; in the Reception of which, the *Dentes Incisorii*, or Cutting-Teeth are sometimes employ'd, in dividing it from the more bulky part ; when a proportionable

onable piece is thus taken into the Mouth, the lower Jaw is variously mov'd by its proper Muscles, and Mastication is begun and carry'd on by the Assistance of the Tongue, Cheeks, and Lips; the two first still applying the less divided parts of the Aliment, to the *Dentes Molares*, till there's an equal Comminution of all its Parts; nor is the Action of Mastication meerly perform'd for dividing the grosser parts of the Aliment; but divers of the Muscles employed in the Motion of the lower Jaw, are at the same time also serviceable in hastening the *Saliva* or Spittle, separated from the Blood by the Parotid Glands; those of the lower Jaw, and under the Tongue into the Mouth; the Salival Glands of the Cheeks and Lips also contributing their Juices, do altogether joyn with the Masticated Aliment, before or at the same time it's made fit to be swallowed; which Action is called *Deglutition*.

*Deglutition* is thus perform'd; the Aliment as well what's fluid as that Masticated being lodged on the Tongue, which does somewhat hollow it self, by means of its own proper Muscular Fibres, for the more commodious entertaining the larger quantity, its tip and sides are applied to the insides of all the Teeth of the upper Jaw, (and *Gingivæ* or Gums of those who want Teeth) the Tongue is suddenly drawn up by the *Musculi Styloglossi* and *Myloglossus*, together with those Muscles which pull the *Os Hyoides* upwards; at the same time the *Fauces* are also drawn up, and their Cavity enlarged by the *Musculi Stylopharyngei*; and about two thirds of the Tongues superiour Surface is adequately apply'd to the Roof of the Mouth; the *Epiglottis* from its position being consequently depress'd, does thereby cover the *Glottis* or *Rimula* of the *Larynx*, and prevents any part of the Aliment from descending into the Wind-pipe: In this part of the Action of *Deglutition* the Glands  
under

under the Tongue, and Excretory Ducts of those of the lower Jaw are Comprest, and their separated Liquors or Spittle voided by their *Papillæ*, situated at the lower part of the *Frænum* or Ligament of the Tongue; and this is done by the *Musculus Mylo hyoideus*, as is explained in our *Myotom. Reform. pag. 76.* When the Aliment by the above-mention'd Motion of the Tongue, is forced into the *Fauces* or upper part of the *Gula*; at the same time the *Gargareon*, together with the *Uvula*, are drawn upwards and backwards by the *Musculi Sphænostaphili*, by which means any part of the Aliment is hindered from ascending into the *Foramina Narium*; the Fauces by the *Musculus Pterygopharyngeus* as is demonstrated in our *Myotom. Refor. pag. 88.* and *Oesophageus*, are contracted, whereby the Aliment is not only comprest into the *Gula*, but the Matter separated from the Blood by the Glands of the Fauces, especially of those large ones called *Tonsillæ*, is forced out of their Cells or Excretory Ducts, to join with it in its descent to the Stomach by the *Gula*, through which latter it passes, by the Action of its *Muscular Fibres*.

The Aliment thus Impregnated with *Saliva* in Mastication and Deglutition, being receiv'd into the Stomach there meets with a Juice separated from the Blood by the Glands of that part, whose Excretory Ducts open into the Cavity of the Stomach: By the commixture of these Liquors whither of *Saliva* or Juice of the Stomach, a proper *Menstruum* is Composed, by which the parts of the Aliment are still more and more divided by its insinuating into their Pores, by which the Air before imprisoned in their less divided parts, is not only set more at liberty, but by the natural heat, it must necessarily suffer such a Rarefaction, as that thereby the whole Stomach becomes still more and more Distended; hence it is we have less Appetite some time

after eating (when this Intumescency is made) than we had immediately after; hence also arise those frequent *Eruclations* from divers Aliments, as old Pease, Cabbage, and divers other Vegetables we frequently eat; all which become very much disturbing in deprav'd Appetites and weak Stomachs. Tho' we have not used the word *Fermentation*, yet we do not suppose the Dissolution of the Aliment within the Stomach can be done, at least without an Intestine Motion of its Particles with the *Menstruum*; but we have omitted that Term, because it may be apt to lead us into an Idea of a greater Conflict than in truth there really is.

At the same time this Intumescence and agitation of the matter is made in the Stomach, the Contents of the Neighbouring Excretory *Ductus's*, namely the Bile in the Gall-Bladder, and Liver-Ducts, and Pancreatick Juice in the *Ductus Pancreaticus* are compest in to the *Intestrinum Duodenum*, through the Extension of the Stomach it self: The reflux Blood of the Stomach, at that Instant being in some measure retarded, whereby the *Muscular Fibres* are more liable to be Contracted, as we have intimated in our Conjecture of *Muscular Motion*, in our Introduction to our *Myotom. Reformata*, pag. 12.

Nor can we conceive how the Liquor of the Stomach, after having joined with the Saliva and Aliment, should be still so plentifully Excreted from the Glands of that part, as to Irritate its internal Membrane, and excite its *Muscular Fibres* to Contract, since the Muscles of the *Abdomen* would in like manner as in Vomiting, be drawn into a consent of *Cooperating*, and the Aliment would be forcibly rejected by the Mouth: Besides, should the Liquor of the Stomach be so disturbing in *Chylification*, what would it be so soon as all its Contents were discharged. The Irritation the Stomach undergoes in  
Hunger,

Hunger, we are firmly perswaded does not arise but through an Accumulation of the Saliva in the Stomach, in Conjunction with the Liquor of the Glands of that part; whence it is we rather discharge the Spitile at that time by the Mouth, then to suffer any more of it to descend into the Ventricle: Hence proceeds what we call *The Watering of the Mouth*; Hence also, when the *Saliva* is vitiated, the Appetite is Deprav'd.

The Stomach, by means of its *Muscular Fibres* contracting it self, does gradually discharge its Contents by the *Pylorus* into the *Duodenum*, in which Gut, after a small *Semicircular* descent, it meets with the Pancreatick Juice and Bile; both which joining with it, renders some parts of the Aliment more fluid, by still disuniting the grosser parts from the more pure; and here *Chylification* is made perfect. The Bile which abounds with Lixivial Salts, and apt to intangle with the grosser parts of the Concocted Aliment, stimulates the Guts, and Deterges or Cleanses their Cavities of the *Mucous* Matter, separated from the Blood by Glands of the Guts, and lodged in their Cavities; which not only moistens the insides of the Guts, but defends the Mouths of the Lacteal Vessels from being injured by *Alien* Bodies which often pass that way.

The Contents of the Intestines moving still on by means of the *Peristaltick* or Wormlike Motion of the Guts, whilst those thinner parts fitted for the Pores of the Lacteal Vessels, called Chyle is absorbed by them; the thicker move still more slowly on, and by the many stops they continually meet with by the *Connivent-Valves*, all the Chyle or thinner Parts are at length intirely absorb'd, the remains being meerly Excrementitious, are only fit to be excluded by Stool.

The Analogous white appearance of the Chyle, whether in the Stomach, or Intestines, and always in the *Venæ lacteæ* and *Thoracick* Duct, may be seen in the Commixtures of divers Liquids, which separated exhibit no such appearance: Nor is this *Phænomenon* any otherwise then a Transposition of Particles, whether by a *Menstruum's* insinuating into them, dividing them into gross Globules, as an Acid into a Sulphur, as Vinegar with Oyl, &c. or else by Precipitation, as when a Gum-mous or Resinous Body is dissolved in a Spirituous *Menstruum*, and mixt with a Flegm; so Tincture of Myrrh and Benjamin, &c. make a Milky Appearance in common Water.

The Longitudinal and Transverse Orders of Fibers of the Guts, are the Instruments by which the Peristaltick Motion of them is perform'd, which Motion is not only necessary for pushing their Contents forwards, but by the reciprocal Contraction of those Muscular Fibres of the Guts, and apposition of their *Connivent Valves*, the Mouths of the Lacteals are disposed to receive what's fitted for them; hence it is we can by no means make any Fluid, whatever pass from the Cavity of the Guts, into those Lacteal Vessels, in a Dead Animal. A farther use of this Contraction of the Muscular Fibres of the Intestines, is to Accelerate the *Chyle* in its progress in the Lacteals, till the Lympha deriv'd from the Extremities of the Arteries of the Guts joins with it; which Conjunction is made in the *Lacteals*, before they leave the External Surface of the Intestines: By this means the Progression of the Chyle is made towards the Mesenterick Glands, into whose Cells it's received, where it again mixes with a Juice brought in by the Arteries of each Gland; which Juice or Lymphatick Liquor, not only farther Dilutes the Chyle, like that from the Arteries of the Intestines, but adds a fresh Im-

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petus, by which its Motion is farther carried on through the *Vasa Lactea Secundi generis* ; ( arising out of each Mesenterick Gland, and discharging their Contents into the Receptaculum Chyli ) Here the Chyle meets and joins with the Lympha sent through the Lympheducts from the inferiour Limbs and Neighbouring Parts, whereby the Chyle is not only farther prepared ; but its Ascention is promoted in the Thoracick Ducts, whose several Divisions and Inosculations ( like the Veins of the Testicles ) with its many Valves looking from below upwards, and advantageous situation between the great Artery and Vertebrae of the back, together with the Lympheducts, discharging their Lympha deriv'd from the Lungs and Neighbouring Parts of the Thorax does demonstrate the utmost Art still us'd in order to its Ascention towards the left Subclavian Vein. Before the Thoracick Duct, thus charged with the Chyle and Lympha, empties its self into the Subclavian Vein ; it receives the Lympha brought from the Superiour Parts, all which joining, are soon discharged into the left Subclavian Vein, where meeting with the Reffluent Blood of the Superiour Parts, passes with it through the Descending Trunk of the *Vena Cava*, and joins with the Reffluent Blood of the Inferiour Parts, in the right Auricle of the Heart ; whence its expell'd by its Contraction into the right Ventricle, when the Heart is in *Diastole* ; but by the *Systole* or Contraction of the Heart, its again driven out thence into the Arteria Pulmonalis, through whose Extremities, in Conjunction with those of the Vena Pulmonalis, it passes to the left Auricle and Ventricle of the Heart, from whence its again expell'd in the *Systole* ( as above ) in the *Aorta* or Arteria Magna, by whose branches its conveyed through the whole Field of the Body : The Three Tricuspid Valves in the right, and two Mitral Valves in the left Ventricle



tricle of the Heart opposing its return into the Veins, and the Semilunary Valves of Arteria Pulmonalis and Aorta preventing its ingress into the Ventricles are sufficient (when rightly considered) to demonstrate the necessity of a Circulation of this grand Fluid called Blood. Thus *Sanguification* is begun, and as we have mentioned the divers preparations of the Aliment, before Chylification, so here may be observed the various Mixtures and Preparations of Chyle in order to Sanguification, which he shall leave for a more discerning Eye to prosecute.

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